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14. ABSTRACT

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36 Separate items are enclosed

1122 038

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (TI) (STINFO) 10 Aug 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-TP-2000-163**
Liu, C.T., "Strain Rate Effect on Crack Opening and Growth in a Particulate Composite Material at Low Temperature"

3rd Conference on Mechanics of Time Dependent Materials (Statement A)
(Erlangen, Germany, 18-20 Sep 00) (Submission Deadline: 28 Aug 00)

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_____

PHILIP A. KESSEL Date
Technical Advisor
Propulsion Science and Advanced Concepts Division

Strain Rate Effect on Crack Opening and Growth in a Particulate Composite Material at Low Temperature

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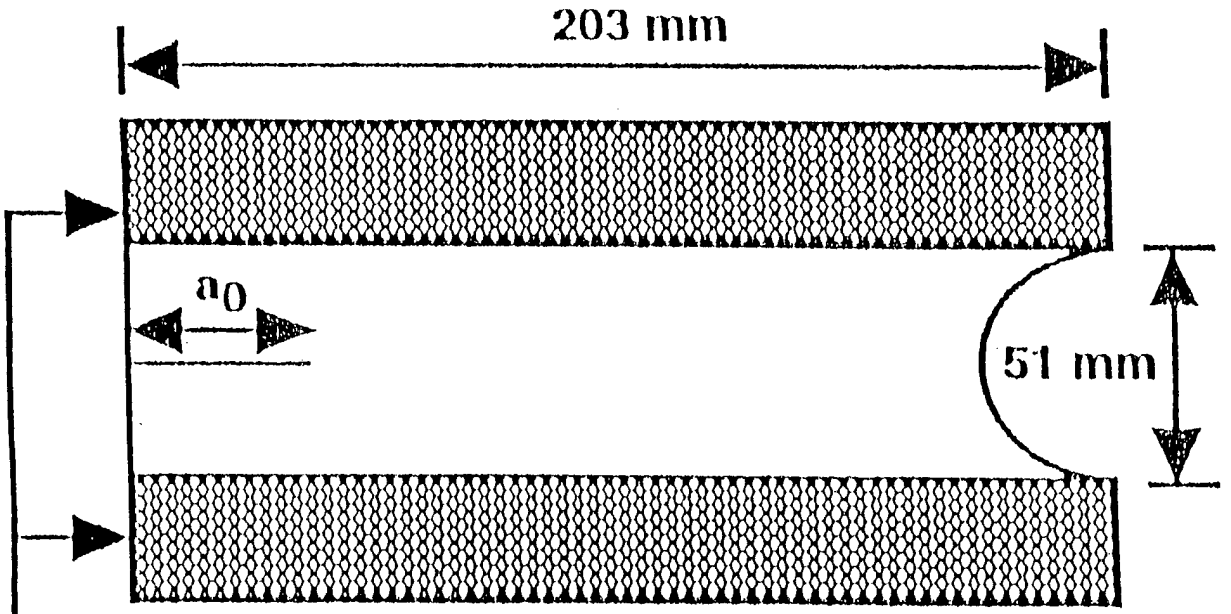
Objective

- Investigate the Effects of specimen thickness (2.54 mm and 12.7 mm) and Displacement Rate (2.54 mm/min and 12.7 mm/min) on Crack Opening Displacement, Failure process Zone, Local Strain Fields, and Crack Growth Behavior at Low Temperature.

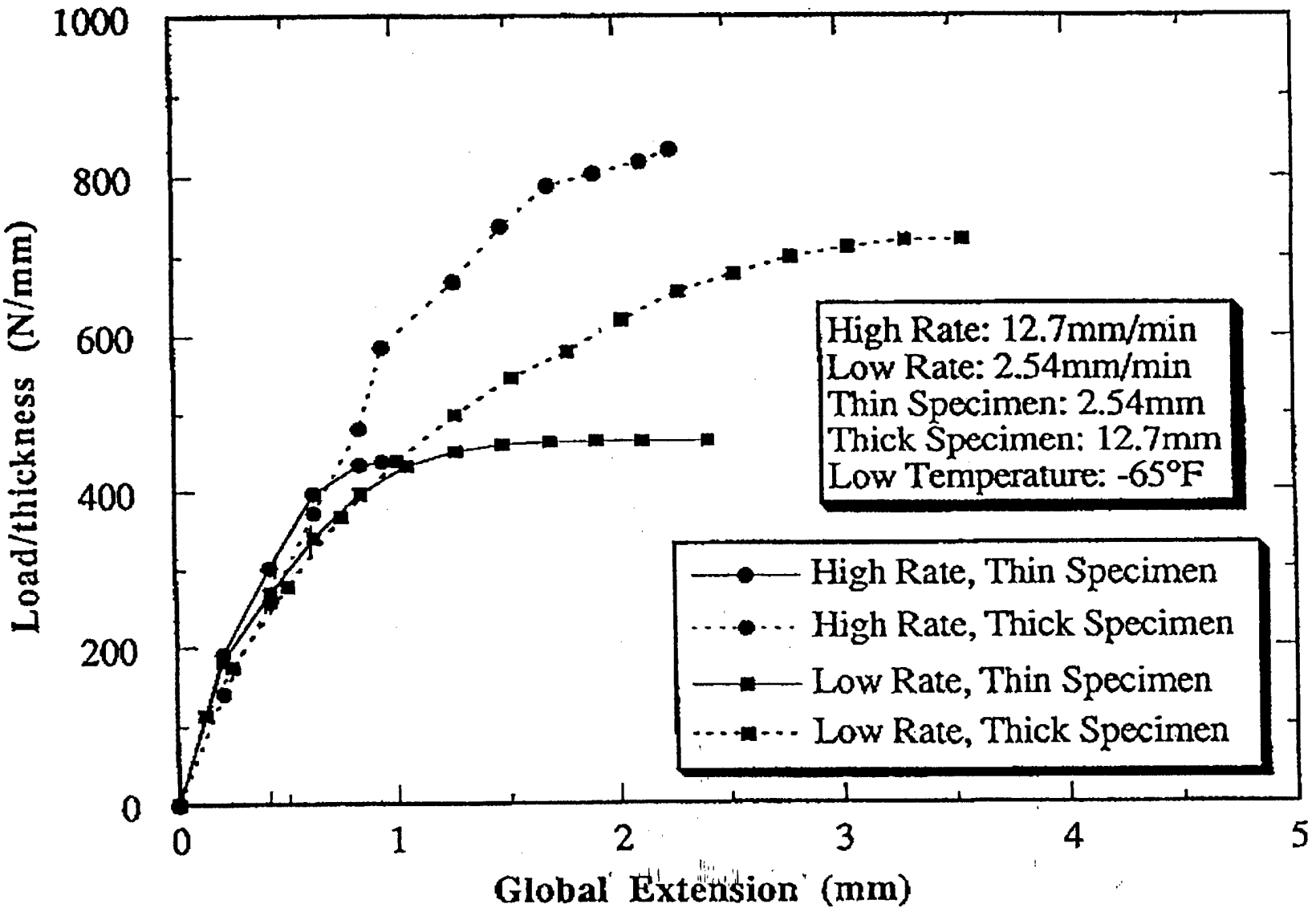


Aluminum grips cemented to specimen
Specimen thickness: 2.5 mm

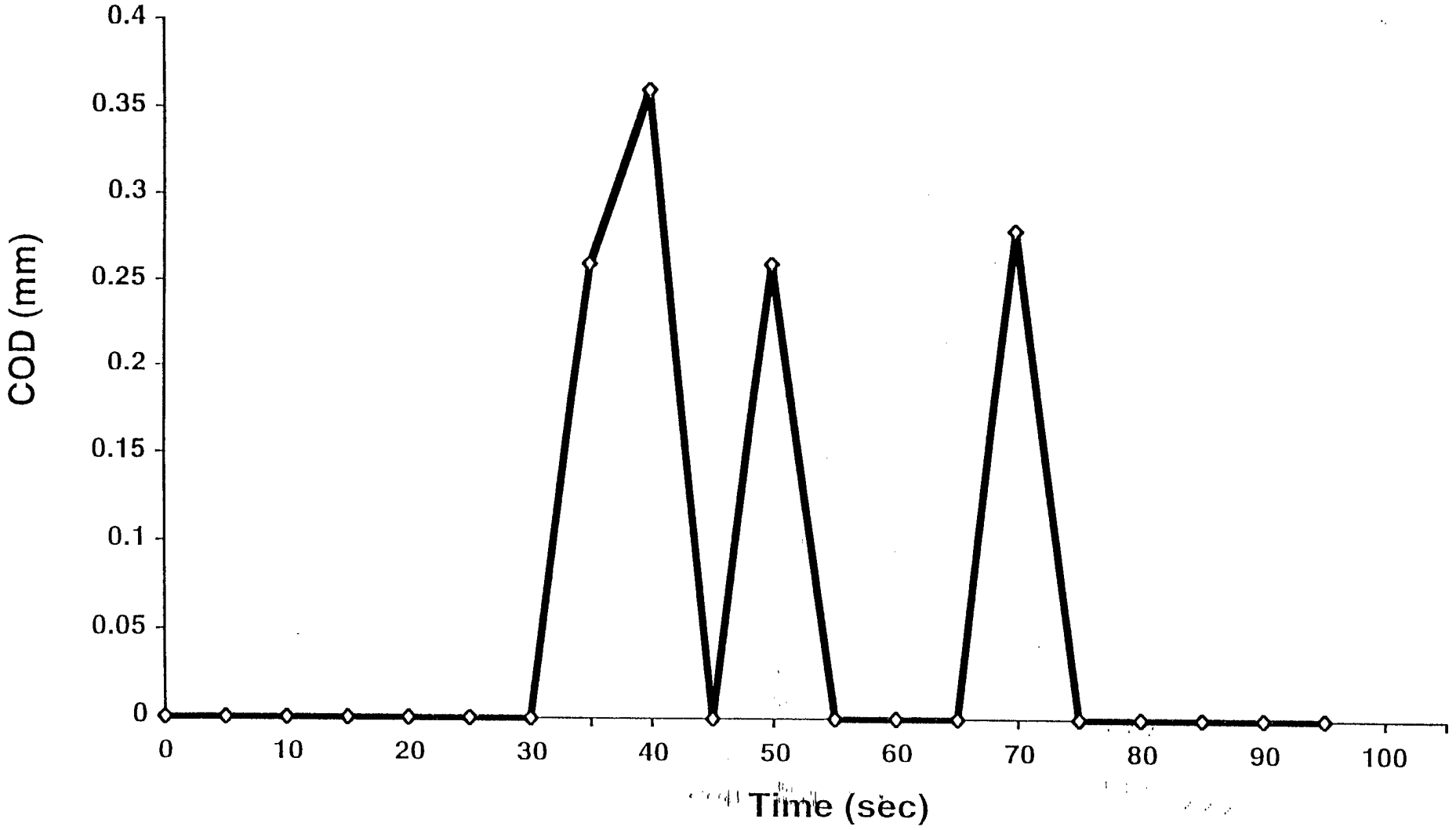
a_0 = 23mm

Specimen Geometry

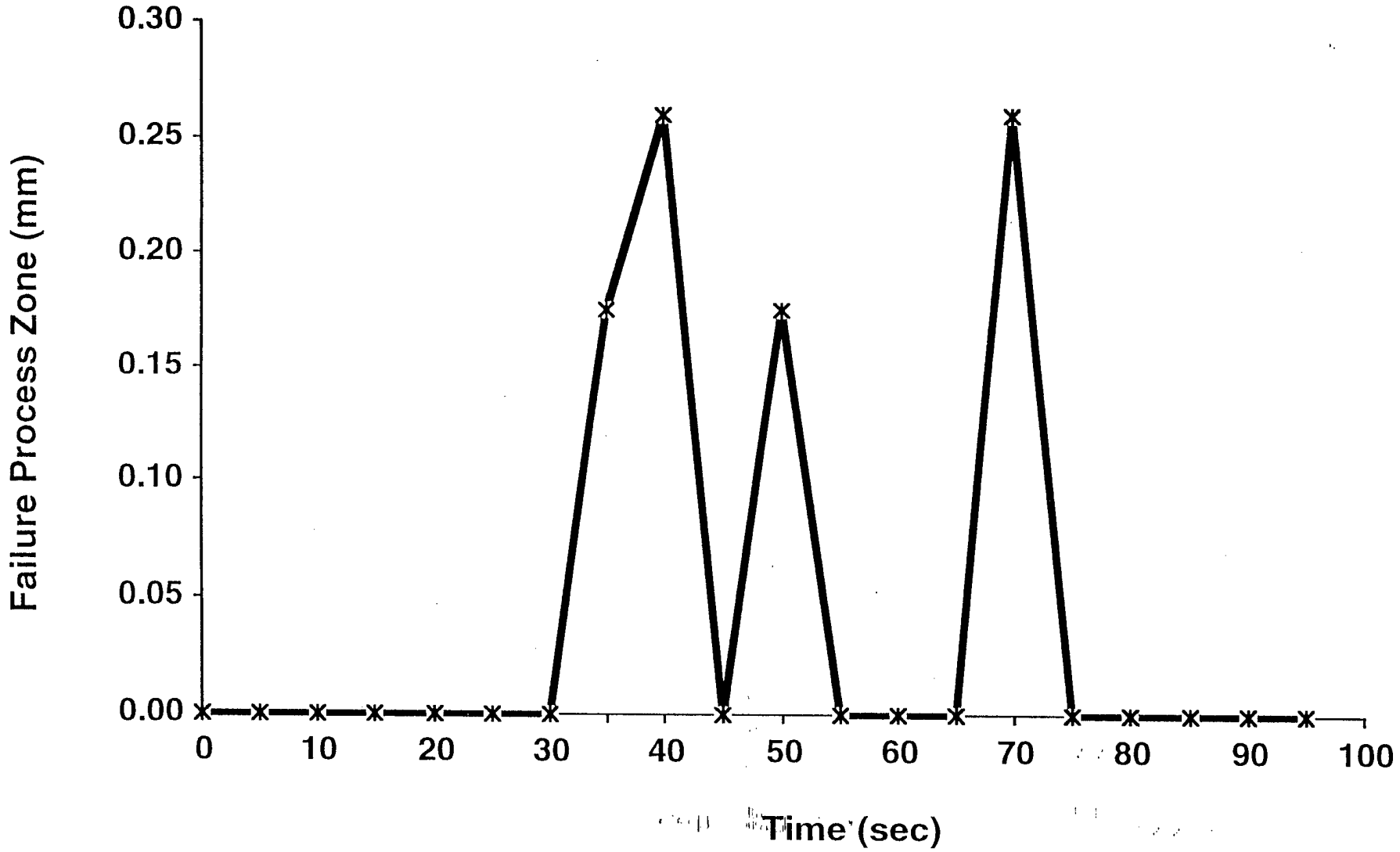
Load / Thickness vs. Global Extension



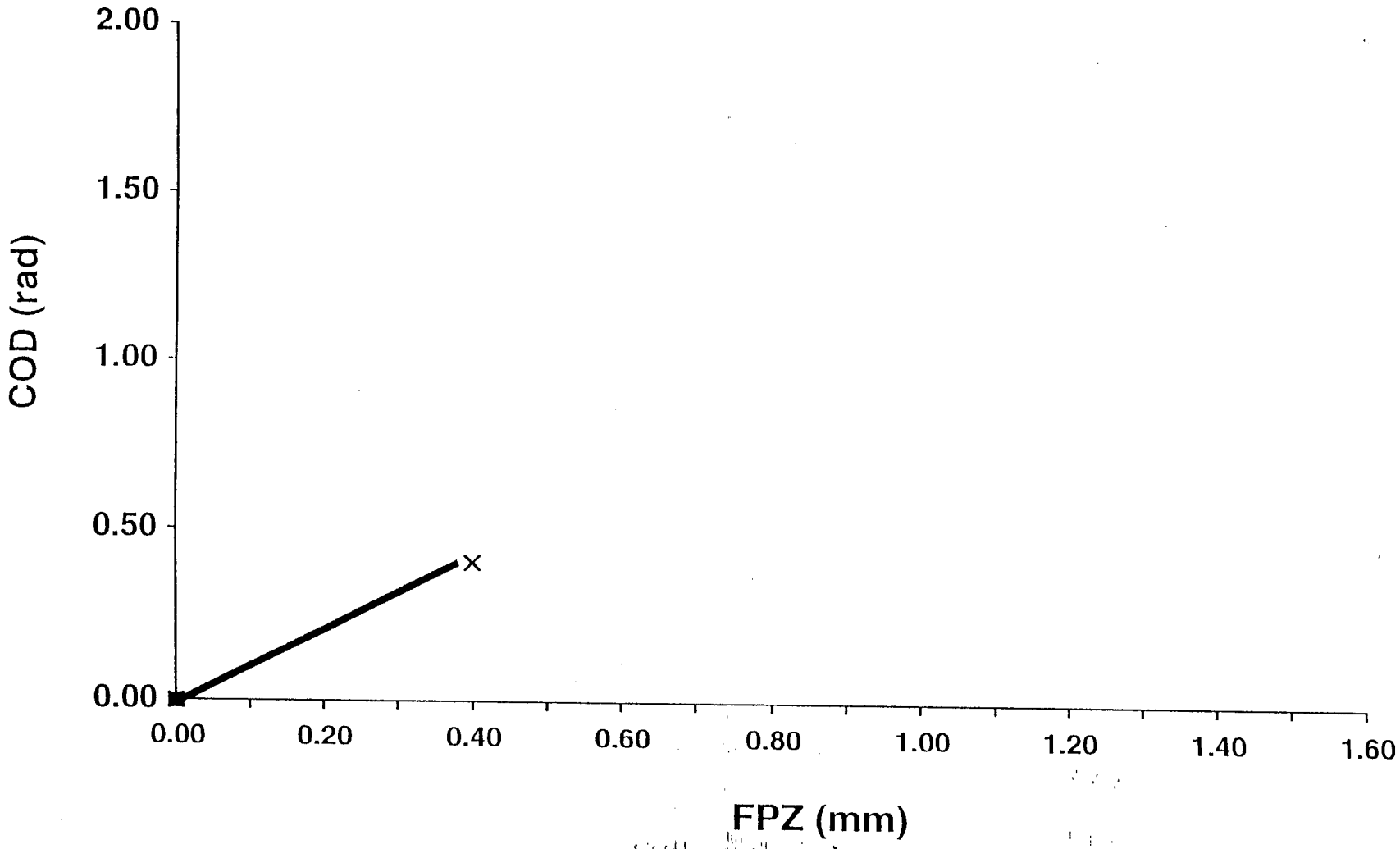
TKLRLT - COD vs. Time



TKLRLT - Failure Process Zone vs. Time



TKLRLT - COD vs. FPZ



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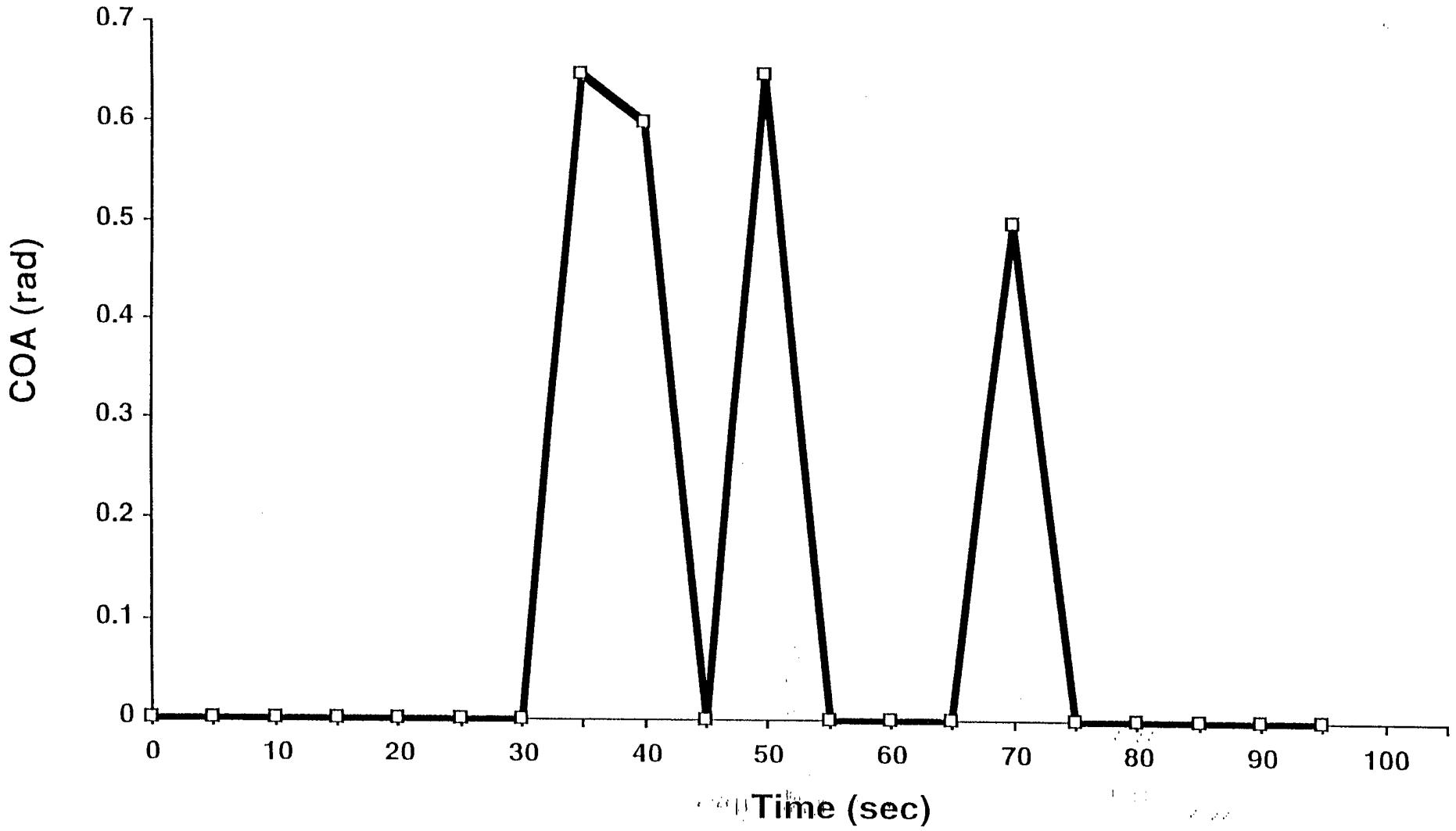

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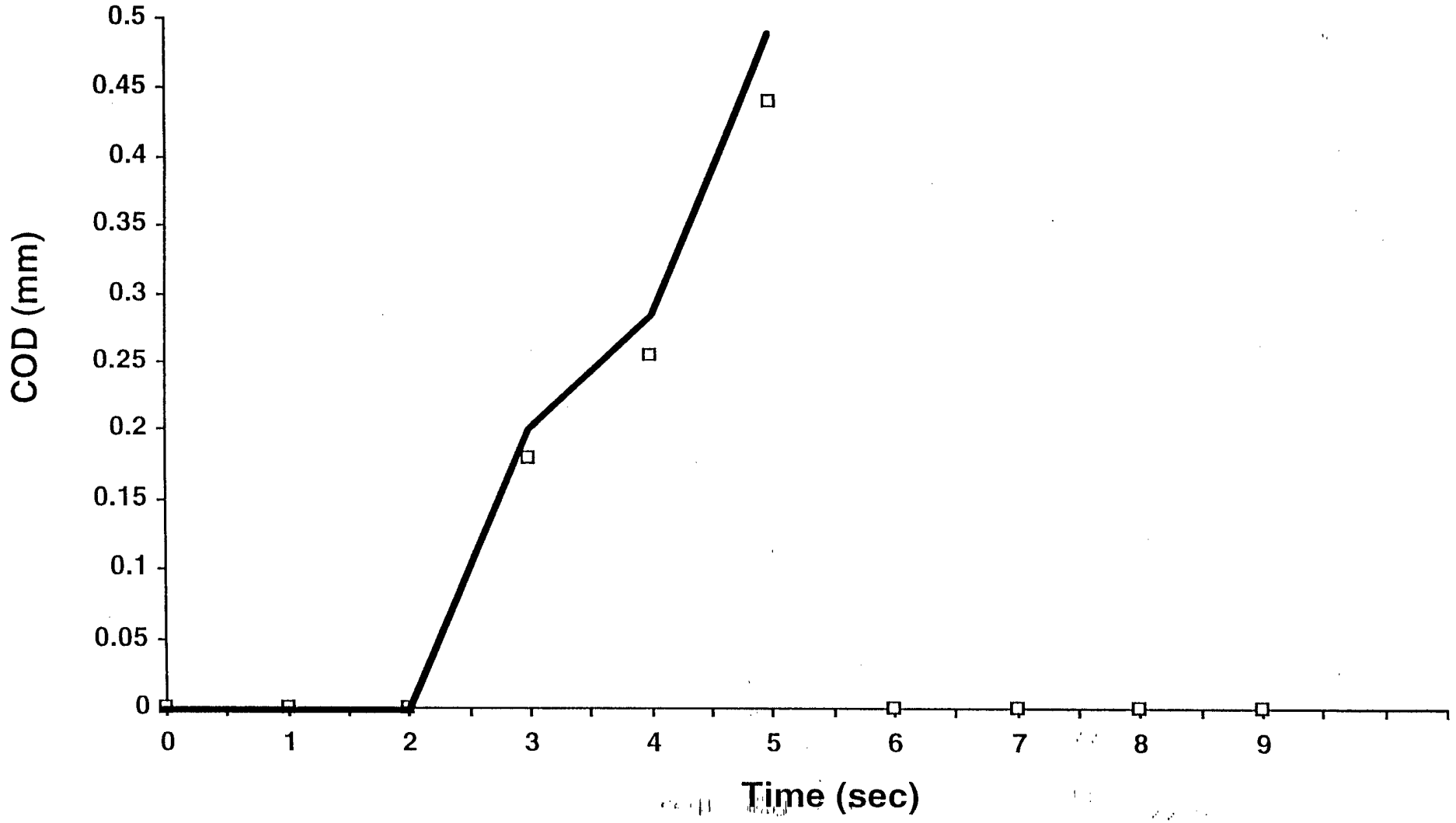

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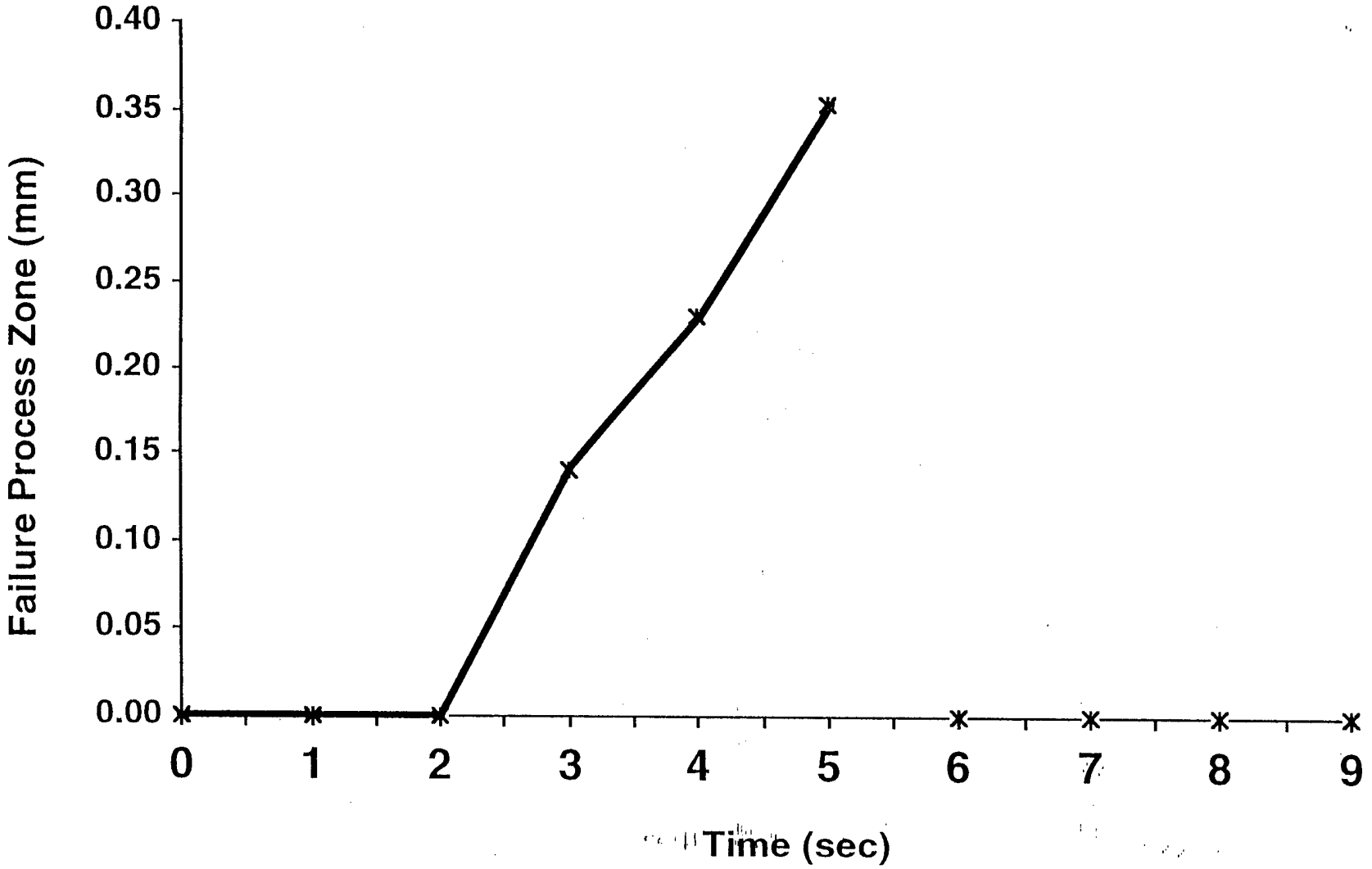

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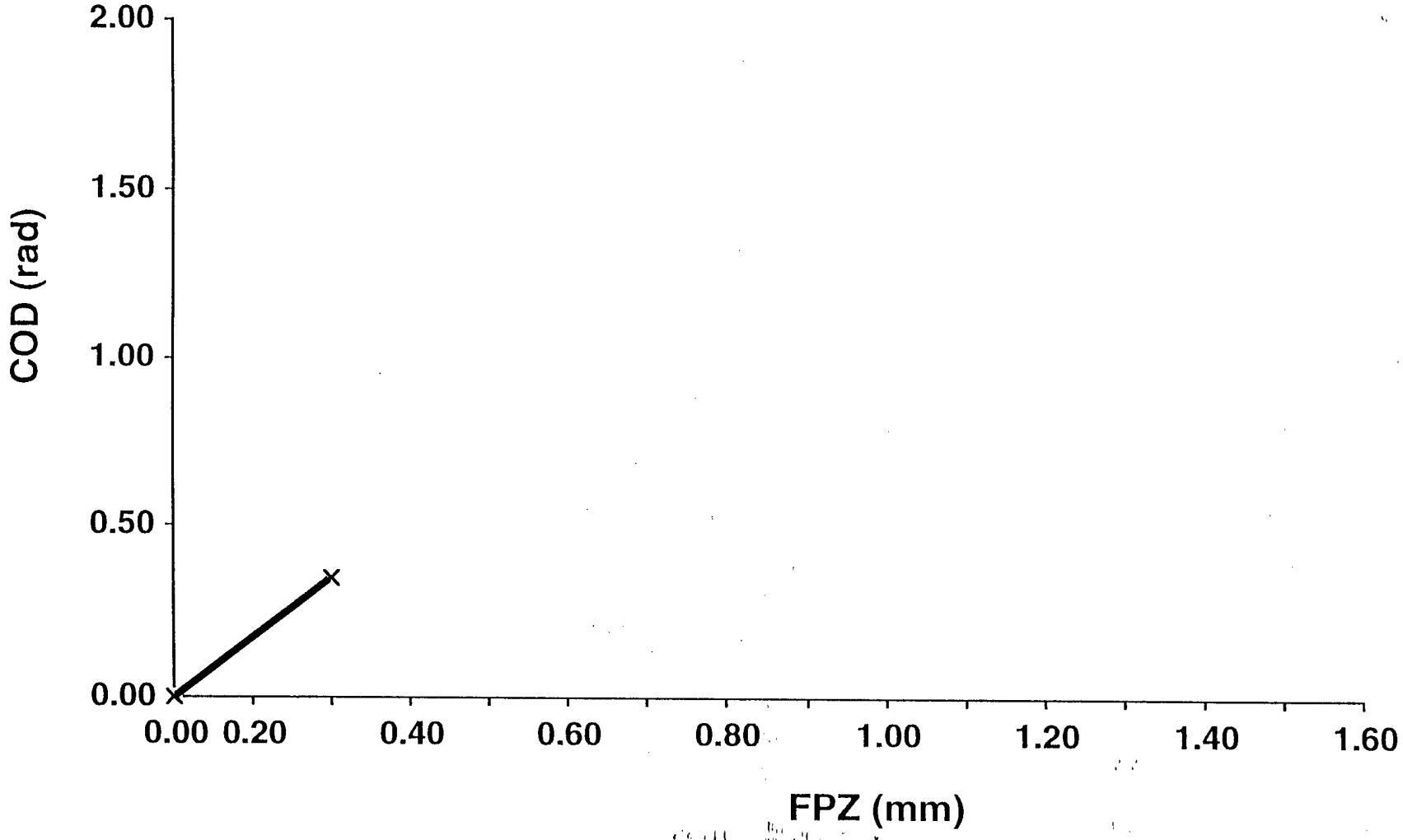

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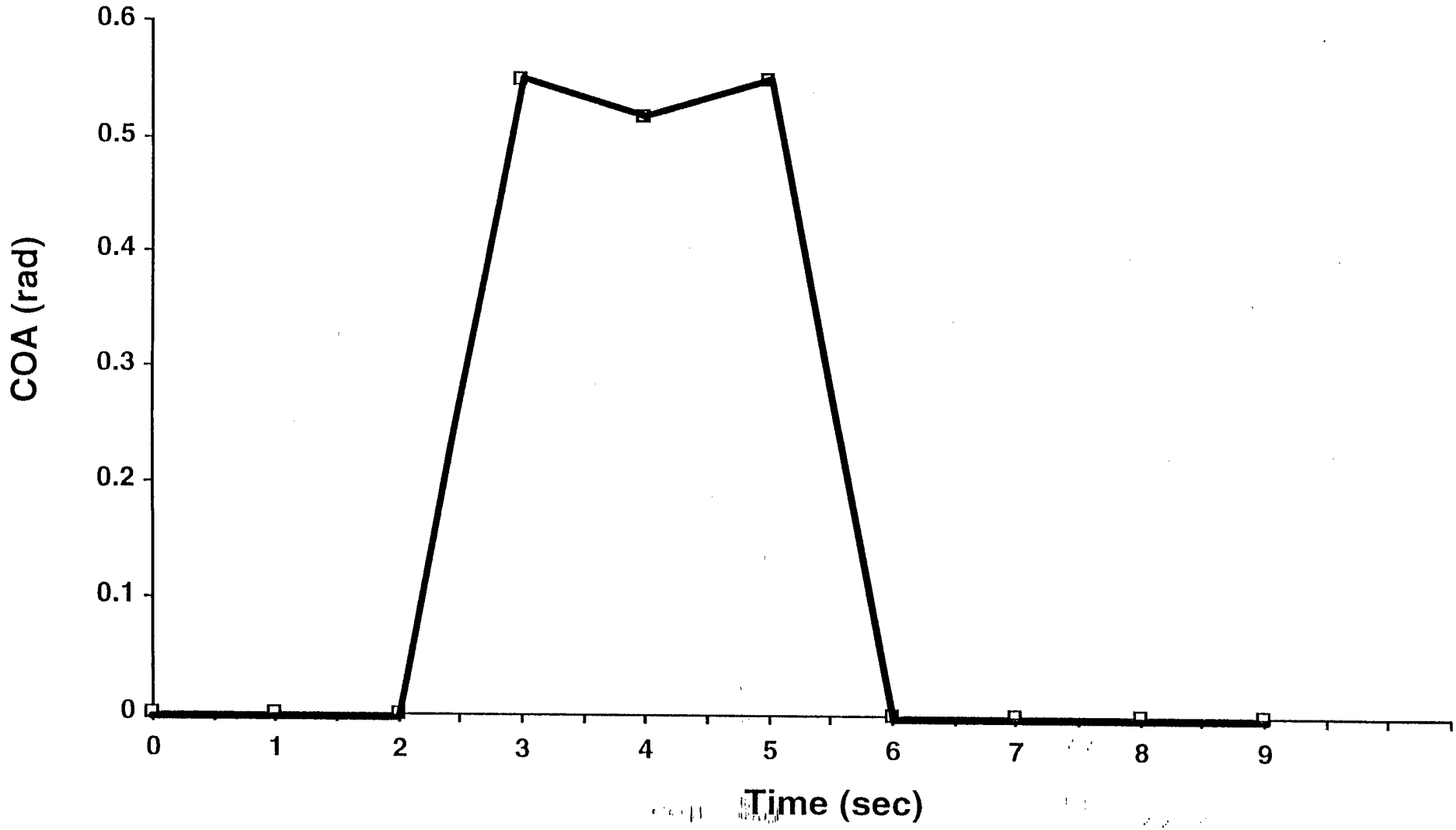
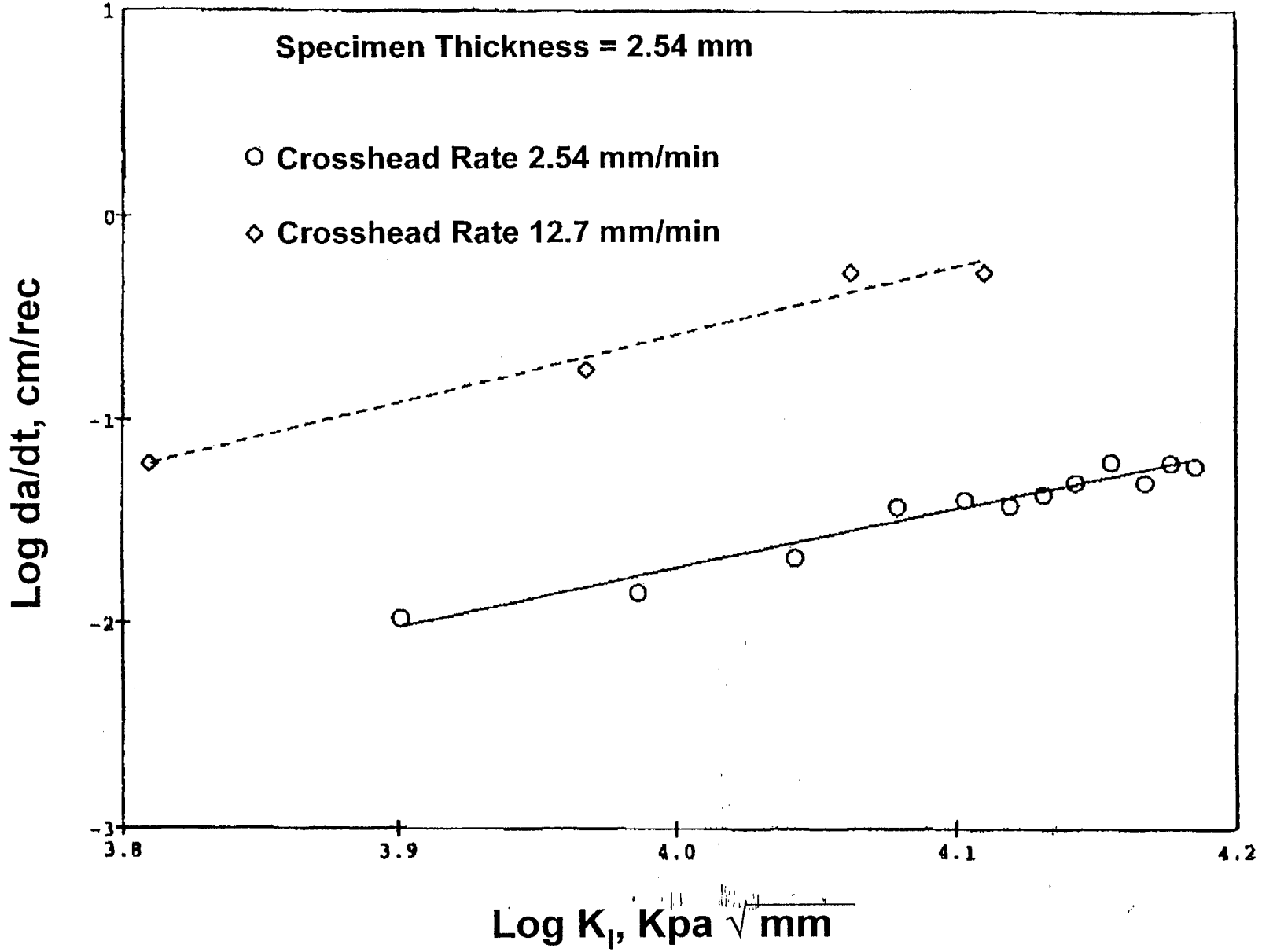


Crack Growth Rate vs. Mode I Stress Intensity Factor



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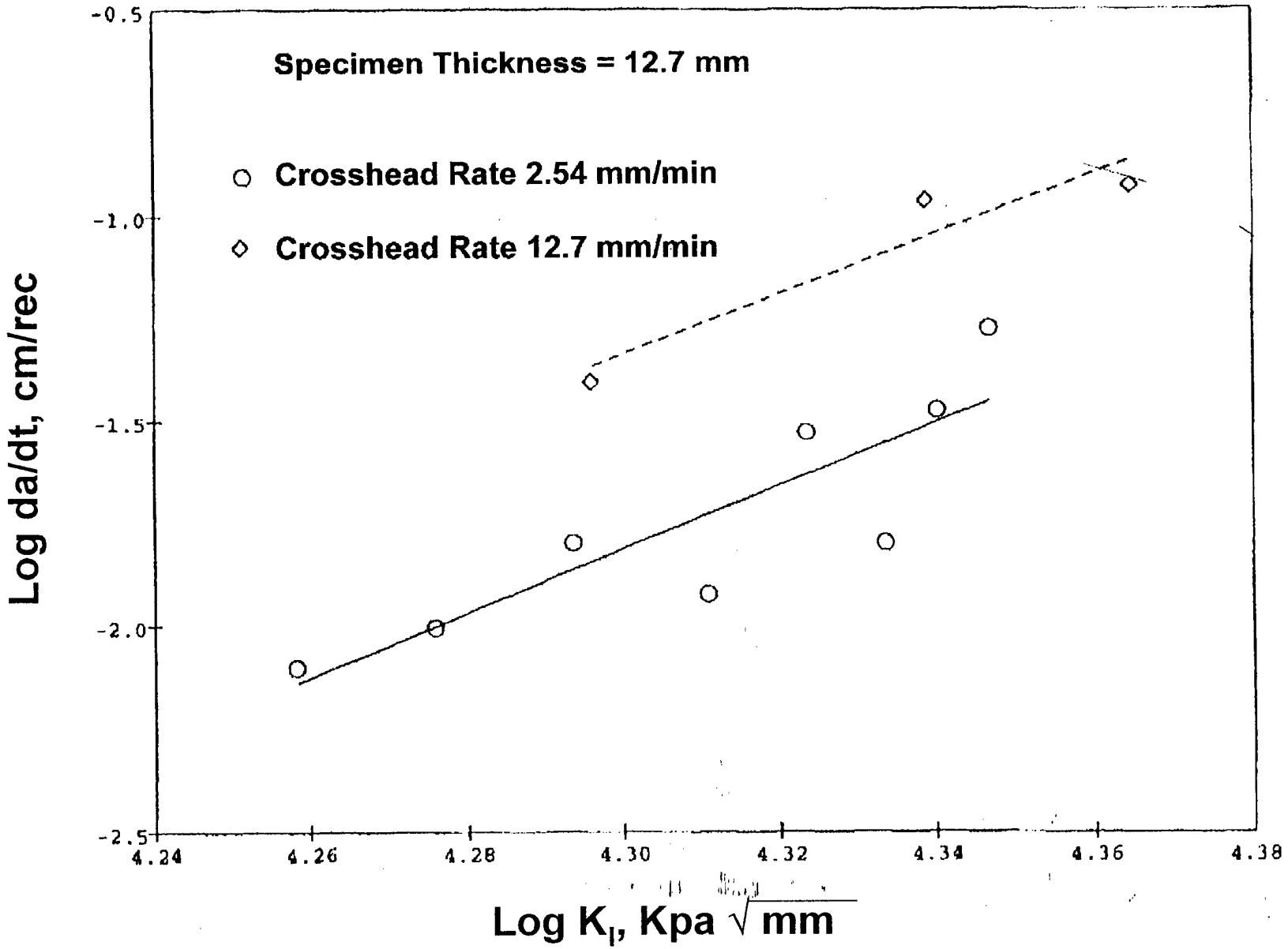
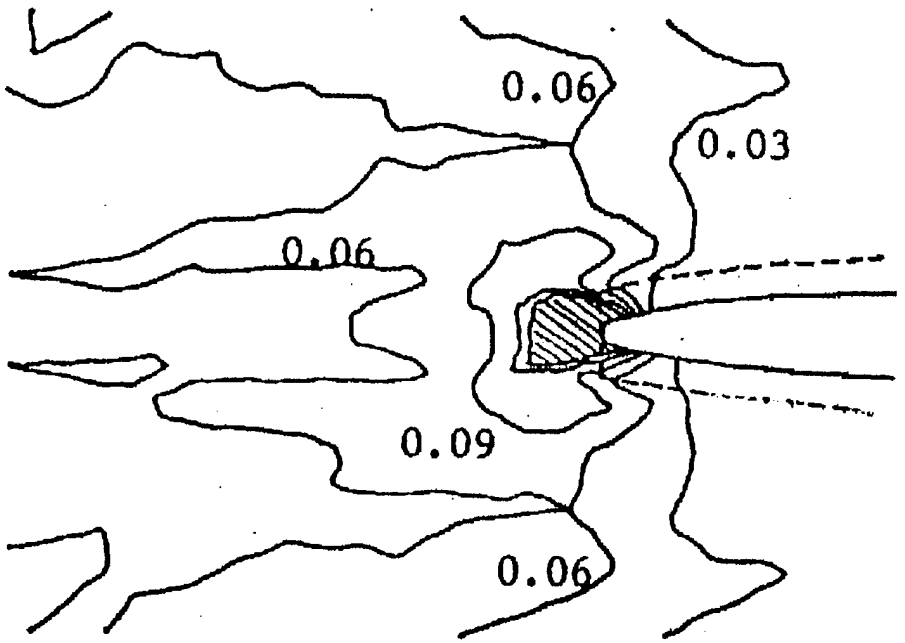
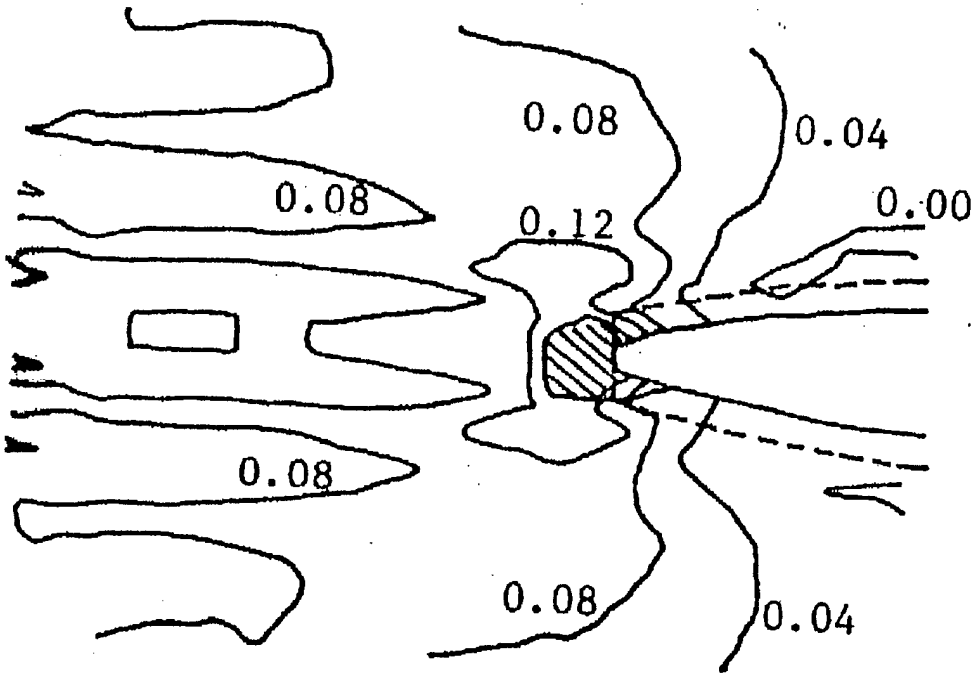


Iso - Intensity Strain Contours (thickness = 0.1 in.)

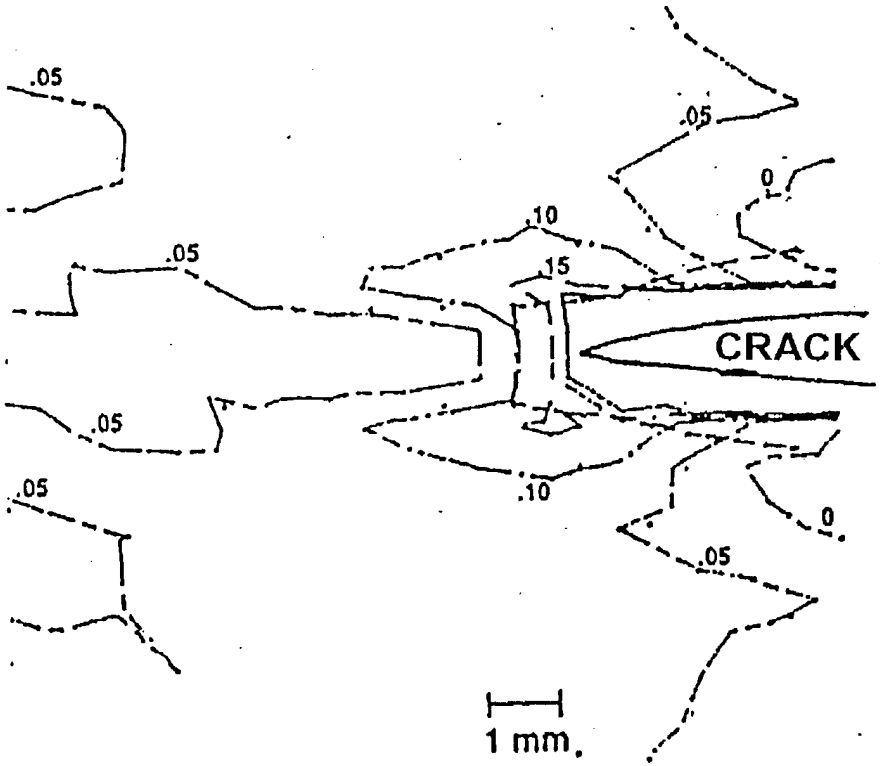


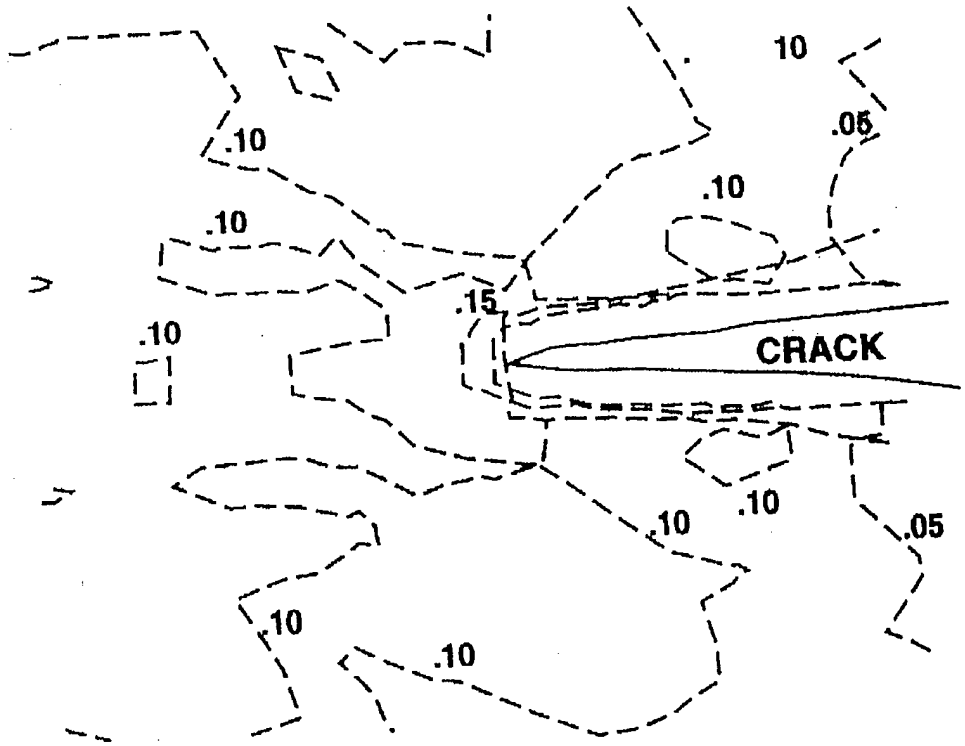
Crosshead Rate = 12.7 mm/min
Global Strain = 0.83%



Crosshead Rate = 2.54 mm/min
Global Strain = 0.83%

Iso - Intensity Strain Contours (thickness = 0.5 in.)





Crosshead Rate = 2.54 mm/min
Global Strain = 3.3%

Crosshead Rate = 12.7 mm/min
Global Strain = 3.3%

Conclusions

- For the thin specimen and the thick specimen tested at 2.54 mm/min, the basic crack growth behavior consists of a blunt – growth – blunt phenomenon.
- For the thick specimen tested at 12.7 mm/min displacement rate, a classical brittle fracture occurs.
- The increase in displacement rate alters the local strain fields but the iso-strain contours are of the same general form.
- A power law relationship exists between the Mode I stress intensity factor and the crack growth rate.